



Clean Hydrogen Innovation Co-Funding for Federally Funded Opportunities

Program Opportunity Notice (PON) 5322

Up to \$10 million Available

All, some, or none, of the available funds may be awarded.

NYSERDA reserves the right to extend and/or add funding to the Solicitation should other program funding sources become available.

Proposals Due: June 28, 2023, by 3:00 PM Eastern Time

Program Summary

The New York State Energy Research and Development Authority (NYSERDA) announces the availability of up to \$10 million in co-funding for New York-based clean hydrogen research, development, and demonstration (RD&D) projects that are also applying for federal funding opportunities. This funding opportunity can help proposers achieve **federal funding award cost-sharing** requirements (subject to applicable contracting laws, rules, and regulations).

Federal funding sources may include, but are not limited to, funding opportunities through the U.S. Department of Energy (DOE), Advanced Research Projects Agency – Energy (ARPA-E), or U.S. national laboratories. This PON aims to provide NYSERDA co-funding to federally funded projects in New York to increase the likelihood of successful product development and technology commercialization for clean hydrogen RD&D projects in the state. To be eligible for funding, proposers must have submitted or be in the process of submitting a concept paper or proposal for federal funding related to the solicitation challenge areas outlined below.

Final NYSERDA award is contingent on the proposer successfully executing a federal funding contract. If federal funding is not awarded or a federal funding contract is not successfully executed, the proposer will not be eligible to execute a contract with NYSERDA through this solicitation. NYSERDA is not a partner, grantee, sub-grantee, contractor, or sub-contractor to the federal awardee and NYSERDA is not responsible for meeting the federal awardee's responsibilities.

Funding in this solicitation focuses on Clean Hydrogen Innovation in the following technical challenge areas:

- Challenge 1. Hydrogen applications to decarbonize industrial process heat
- Challenge 2. Clean hydrogen production and integration with renewable energy resources
- Challenge 3. Mitigation of nitrogen oxides (NO_x) emissions from hydrogen combustion
- Challenge 4. Hydrogen storage technologies for bulk storage and limited footprint areas

Three categories of projects will be considered for funding. Estimated Technology Readiness Level (TRL) for each category and a summary of NYSERDA funding per award for each category is provided below:

Funding Category	Estimated Technology Readiness Level (TRL)	NYSERDA Funding Per Award
Category A: Feasibility & Research Studies	1-3	\$400,000
Category B: Product Development	4-6	\$1,000,000
Category C: Pilot & Demonstration Projects	7-9	\$2,000,000

Proposal Submission:

Online submission is preferable. Proposers may submit Word, Excel, PowerPoint, or PDF files (file formats include: csv, doc, docx, gif, jpeg, jpg, pdf, png, ppt, pptx, pps, ppsx, tif, txt, xls, xlsx, and zip). Individual files should be 100MB or less in file size. Proposal PDFs should be searchable and should be created by direct conversion from MS Word, or other conversion utility. Files should not be scanned. For ease of identification, all electronic files must be named using the proposer's entity name in the title of the document. NYSERDA will also accept proposals by mail or hand-delivery if online submission is not possible. For detailed instructions on how to submit a proposal (online or paper submission), click the link "[Application Instructions and Portal Training Guide](https://www.nyserda.ny.gov/Funding-Opportunities/Current-Funding-Opportunities.aspx) [PDF]" located in the "Current Opportunities" section of NYSERDA's website (<https://www.nyserda.ny.gov/Funding-Opportunities/Current-Funding-Opportunities.aspx>).

Questions? Please see designated contacts below:

- No communication intended to influence this procurement is permitted except by contacting Haiyan Sun (Designated Contact) at (518) 862-1090, ext. 3311 or by e-mail at pon5322@nyserda.ny.gov (for technical questions).
- If you have contractual questions concerning this solicitation, contact Nancy Marucci (Designated Contact) at (518) 862-1090, ext. 3335 or Nancy.Solicitations@nyserda.ny.gov.

Contacting anyone other than the Designated Contacts (either directly by the proposer or indirectly through a lobbyist or other person acting on the proposer's behalf) in an attempt to influence the procurement: (1) may result in a proposer being deemed a non-responsible offerer, and (2) may result in the proposer not being awarded a contract.

*** All Proposals must be received by 3 p.m. Eastern Time on the date noted above.** Late, faxed, or emailed Proposals will not be accepted. Incomplete proposals may be subject to disqualification. It is the proposer's responsibility to ensure that all pages have been included in the proposal. Please note: for online submission, there are required questions that you will have to answer in addition to uploading attachments and you should allot at least 60 minutes to enter/submit proposals. The online proposal system closes promptly at 3 p.m. Eastern Time, files in process or attempted edits or submission after 3 p.m. Eastern Time on the date above, will not be accepted.

If changes are made to this solicitation, notification will be posted on the "Current Opportunities" section of NYSERDA's website (<https://www.nyserda.ny.gov/Funding-Opportunities/Current-Funding-Opportunities.aspx>).

I. Introduction

Climate Act and Clean Hydrogen

New York State's [Climate Leadership and Community Protection Act \(Climate Act\)](#) enacts one of the most aggressive climate targets in the United States: 40 percent greenhouse gas (GHG) emissions reductions below 1990 levels by 2030, a carbon-free electricity system by 2040, and an 85 percent reduction in GHG emissions below 1990 levels by 2050. Under the Climate Act, the State must also support a just transition and ensure that at least 35 percent of the benefits of clean energy investments go to disadvantaged communities with a goal of 40 percent.¹

Under the Climate Act, New York State's Climate Action Council was tasked with developing and issuing a Scoping Plan with recommendations for both sector-specific and economy-wide actions to achieve the Climate Act's goals and requirements. The Scoping Plan recommends that New York follow "technological and research developments on the use of hydrogen as a tool to reduce greenhouse gas emissions."² Sector-specific recommendations in the Scoping Plan include evaluating opportunities for clean hydrogen and alternative fuels innovation in critical sectors such as transportation (fuel cell electric medium- and heavy-duty vehicles, non-road equipment), buildings (harder-to-electrify buildings, including those on district steam systems), electricity (emphasizing safety, reliability, resilience, and affordability), industry (high-temperature industrial processes), and other hard-to-electrify end uses or systems, where electrification may be more challenging and/or more expensive.³

Since 2020, NYSERDA has conducted early-stage engagement and educational activities across the New York State stakeholder landscape, including robust discussions with climate and environmental justice advocacy groups to identify priorities, opportunities, and concerns around clean hydrogen in New York. Environmental justice and other stakeholder perspectives were instrumental in shaping focus areas and challenges for this solicitation, including prioritizing research into mitigation of nitrogen oxides (NO_x) emissions resulting from hydrogen combustion, and focusing on clean hydrogen production with renewables. These perspectives are expected to similarly support the shaping of other ongoing and future NYSERDA clean hydrogen activities.

Clean Hydrogen Efforts in New York State

New York has undertaken several key efforts to assess potential roles for clean hydrogen. On March 24, 2022, Governor Hochul announced that New York signed a multi-state agreement to develop a proposal for a Northeast Regional Clean Hydrogen Hub under the bipartisan Infrastructure Investment and Jobs Act. NYSERDA is currently in the process of commissioning a series of market analyses and studies to assess clean hydrogen as a solution in New York, considering technology needs and risks, supply and demand potential, infrastructure, resiliency, costs, environmental justice, and job impacts. NYSERDA has also convened a series of meetings, listening sessions, and direct discussions with individuals and groups across the stakeholder landscape to better understand diverse perspectives on clean hydrogen in New York and to prioritize investment focus areas. More information about NYSERDA's efforts in clean hydrogen can be found at <https://www.nyserda.ny.gov/hydrogen>.

Alignment with Federal Clean Hydrogen Funding

The federal government also recognizes the importance of hydrogen as a key piece in the decarbonization puzzle in various sectors of the economy. In addition to the Regional Clean Hydrogen Hubs program, a series of research, development, and demonstration (RD&D) funding opportunities have been announced by federal agencies recently to advance clean hydrogen technologies and deployment.

Recognizing the importance of decarbonizing industry, the U.S. Department of Energy's (DOE) Office of Clean Energy Demonstrations has released a notice of intent (NOI) to support large-scale projects that significantly reduce GHG emissions from heavily emitting industrial subsectors and demonstrate the

¹ New York State Climate Law and Community Protection Act. <https://www.nysenate.gov/legislation/bills/2019/S6599>

² New York State Scoping Plan. <https://climate.ny.gov/resources/scoping-plan/>

³ Ibid.

commercial and technical viability of emissions-reducing tech and processes.⁴ Renewable production of hydrogen via electrolysis also figures heavily in federal funding opportunities: the DOE Office of Hydrogen and Fuel Cell Technologies has issued an NOI to support electrolyzer manufacturing, supply chain development, and advanced electrolyzer tech development;⁵ and the DOE Office of Energy Manufacturing and Supply Chains has issued a funding opportunity announcement (FOA) supporting small- and medium-sized manufacturers (SMMs) to produce or recycle advanced energy property, which includes equipment like electrolyzers that produce clean hydrogen with a well-to-gate carbon intensity of less than 4 kgCO₂e/kgH₂.⁶ The development of novel hydrogen storage technologies aligned with the federal hydrogen shot of \$1/kgH₂ will be supported through an FOA from DOE Office of Hydrogen and Fuel Cell Technologies,⁷ and the DOE Office of Science has issued an FOA that supports basic RD&D at national labs and their partners for hydrogen in the realms of storage, production, and industry.⁸

⁴ DOE Office of Clean Energy Demonstrations Notice of Intent No.: DE-FOA-0002935. <https://oced-exchange.energy.gov/FileContent.aspx?FileID=b89ac88f-754b-4e72-95d7-0164da255299>

⁵ DOE Office of Hydrogen and Fuel Cell Technologies Notice of Intent No. DE-FOA-0002921. <https://eere-exchange.energy.gov/FileContent.aspx?FileID=5be9deb8-aa9e-4250-b4b0-c980cfd6fec6>

⁶ DOE Office of Manufacturing and Energy Supply Chains Funding Opportunity Announcement No. DE-FOA-0002907. <https://oced-exchange.energy.gov/FileContent.aspx?FileID=d033c3ee-2e49-4c74-8bd3-6ef18e72b877>

⁷ DOE Office of Hydrogen and Fuel Cell Technologies Funding Opportunity Announcement (FOA) No: DE-FOA-0002920. <https://eere-exchange.energy.gov/FileContent.aspx?FileID=35bb82b1-ef6-4374-a99d-50526c998661>

⁸ DOE Office of Science National Laboratory Program Announcement No. LAB 23-2954. https://science.osti.gov/grants/Lab-Announcements/-/media/grants/pdf/lab-announcements/2023/LAB_23-2954.pdf

II. Program Funding Areas

A. Program Eligibility

This solicitation is intended to help awardees achieve U.S. Department of Energy (DOE), Advanced Research Projects Agency – Energy (ARPA-E), U.S. National Lab, or other federal funding opportunity cost-share requirements, and to increase the likelihood of successful New York company development and technology commercialization, furthering NYSEERDA's goals. This Program provides an opportunity for a NYSEERDA co-funding commitment in a proposal submission to a competitive federal funding opportunity. Proposals submitted for this purpose must also align with this solicitation's objectives outlined below in sections II.B. Funding Categories and II.C. Innovation Challenge Areas.

Final NYSEERDA award is contingent on the proposer successfully executing a federal funding contract. If federal funding is not awarded or a federal funding contract is not successfully executed, the proposer will not be eligible to execute a contract with NYSEERDA through this solicitation.

For a proposal to be eligible, a proposer must:

- ☐ Fit its proposal into one of the three Funding Categories; and
- ☐ Fit its proposal into one of the four Challenge Areas; and
- ☐ Have submitted a concept paper or proposal or be in the process of submitting a concept paper or proposal for federal funding; and
- ☐ Meet one of the New York eligibility criteria* outlined below.

*New York Eligibility Criteria:

- New York-based entities (including for-profit entities, educational institutions, and non-profits) that have a physical location for business operation in New York State are eligible to apply for funding as a prime recipient or subrecipient.
- Non-New York-based entities are eligible to apply as a prime recipient or subrecipient for Funding Category C (pilot and demonstration projects) if the demonstration site is in New York State. NOTE: All Demonstrations must take place (1) within New York State, and (2) at a site that pays into the Clean Energy Fund (<https://www.nyserda.ny.gov/About/Funding>) through the electric System Benefits Charge (SBC), unless significant statewide benefits are demonstrated.
- Non-New York-based entities are only eligible to apply as a subrecipient for Funding Categories A (feasibility and research studies) and B (product development).

B. Funding Categories

Three categories of research, development, and demonstration will be considered for funding. Estimated Technology Readiness Level (TRL) for each category is provided below.

Category A: Feasibility and Research Studies

- Category A is for feasibility studies that conduct preliminary research into the concepts underlying new products, systems, strategies, or services as a first stage of development. These studies are necessary precursors to ultimate product development and commercialization. Feasibility studies may include conceptual design, technology and market assessments, and similar early-stage studies.
- Estimated TRL: 1-3.

Category B: Product Development

- Category B includes efforts that are crucial to the development of a marketable technology product, system, strategy, or service and any testing or validation of an innovation that is not already commercially available and may lead to the commercialization of products manufactured in New York State.

- Estimated TRL: 4-6.

Category C: Pilot and Demonstration Projects

- Category C is aimed at demonstrating and testing innovative technologies, systems, strategies, or services that have undergone product development and require testing to reach commercialization or are already commercially available but have not yet been sufficiently demonstrated in the U.S. to gain industry acceptance or have yet to be significantly deployed in New York State.
- All Demonstrations must take place (1) within New York State, and (2) at a site that pays into the Clean Energy Fund (<https://www.nyserda.ny.gov/About/Funding>) through the electric System Benefits Charge (SBC), unless significant statewide benefits are demonstrated.
- Estimated TRL: 7-9.

Proposers must select one (1) funding category per project proposal, which must be indicated in the Proposal Narrative (Attachment A). Proposals that do not identify a funding category will not be reviewed and will be deemed ineligible. If the funding category selected does not match the scope of the project, NYSEDA may, in its sole discretion, evaluate the project in terms of a category that in its determination better matches the proposed scope. If such a proposal is selected for award, it will be subject to the requirements of the funding category to which it has been assigned. Multi-phase project proposals (i.e., a single project that spans more than one funding category) will not be considered in this Solicitation.

Proposals must state the existing Technology Readiness Level (TRL) and Commercial Readiness Level (CRL) of any technology being proposed and what the expected TRL and CRL of that technology will be at the end of the proposed project, as a direct result of having undertaken the project. See *Attachment C: TRL/CRL Calculator*.

C. Innovation Challenge Areas

This solicitation only seeks proposals to address the specific Innovation Challenge Areas outlined below. Future revisions of this solicitation may add additional Challenge Areas or update existing ones. Proposals for research on topics other than those identified below, as per the current revision of the Solicitation at the time the proposal is submitted, are not in scope for this solicitation and will be considered non-responsive.

Challenge Area 1: Hydrogen Applications to Decarbonize Industrial Process Heat

Background

Studies show that industrial activities account for 10% of energy use in New York and for 9% of the state's GHG emissions.^{9,10,11}

Industry presents unique challenges to decarbonization given the variety of processes and grades of heat employed across the entire sector, which will require different approaches.¹² Low-temperature ($T \leq 100^{\circ}\text{C}$) and some mid-temperature ($100^{\circ}\text{C} \leq T < 500^{\circ}\text{C}$) industrial heat applications are more amenable to electrification, namely processes that employ steam for process heat. Electric boilers represent a mature and commercially available technology, with efficiencies of 95-99% and capital expenditures 40% lower than their fossil-fueled counterparts.¹³ The higher lifetime costs for electric boilers are currently due

⁹ New York Scoping Plan. <https://climate.ny.gov/resources/scoping-plan/>

¹⁰ Patterns and Trends – New York State Energy Profile. <https://www.nyserda.ny.gov/About/Publications/Energy-Analysis-Technical-Reports-and-Studies/Patterns-and-Trends>

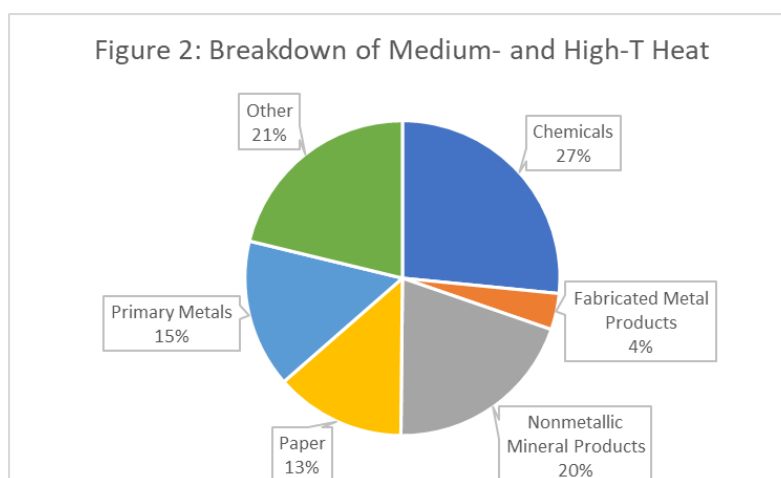
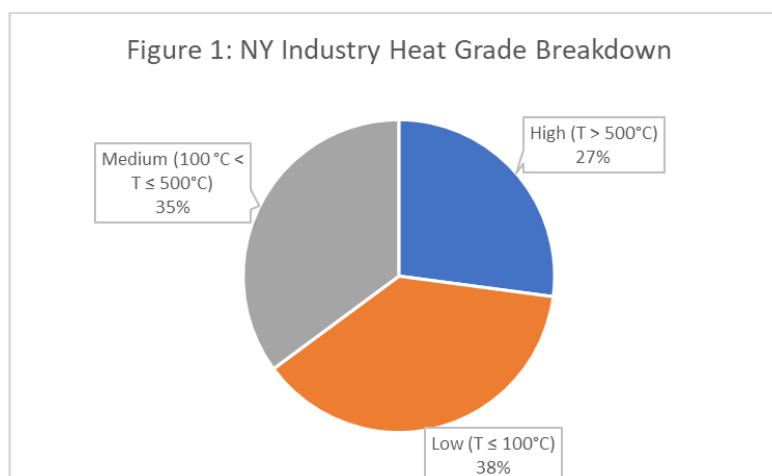
¹¹ New York State Profile and Energy Estimates. <https://www.eia.gov/state/?sid=NY#tabs-2>

¹² DOE Industrial Decarbonization Roadmap, 2022. <https://www.energy.gov/eere/industrial-decarbonization-roadmap>

¹³ Electrification of Boilers in U.S. Manufacturing, 2021. <https://www.globalefficiencyintel.com/electrification-of-boilers-in-us-manufacturing>

to higher electricity costs compared to fossil fuel costs, but as electricity prices come down due to the growing share of electricity generated from renewables, electric boilers will become a more attractive option.^{14,15}

For mid-temperature industrial processes that do not employ steam, or for high temperature industrial processes ($T > 500^{\circ}\text{C}$) sourcing the necessary heat through electrical means alone will prove difficult.^{16,17} In New York, mid- and high-temperature heat from fossil fuels like natural gas and coal accounts for 62% of the total heat consumed in industry (Figure 1), and of this 62%, approximately 35% is employed for the manufacture of primary metals (e.g., aluminum) and nonmetallic mineral products (e.g., glass) (Figure 2), and another 44% is divided between paper, chemical, and fabricated metal parts manufacturing.¹⁸ Decarbonizing these hard-to-electrify industrial processes will require finding an alternative to natural gas and coal that can provide the necessary heat and/or serve as a process input, while remaining carbon-neutral and minimally impacting the manufacturing processes employed by key New York industries.



¹⁴ Ibid.

¹⁵ McKinsey and Company, Plugging In: What Electrification Can Do for Industry, 2020.

<https://www.mckinsey.com/industries/electric-power-and-natural-gas/our-insights/plugging-in-what-electrification-can-do-for-industry#/>

¹⁶ Ibid.

¹⁷ DOE National Clean Hydrogen Strategy and Roadmap, 2022. <https://www.hydrogen.energy.gov/clean-hydrogen-strategy-roadmap.html>

¹⁸ Manufacturing Thermal Energy Use in 2014. <https://data.nrel.gov/submissions/118>.

Clean hydrogen presents a novel opportunity to decarbonize the hard-to-electrify process heat employed by industry in New York. Process heat here refers to the direct application of heat to transform materials as part of the manufacturing process.¹⁹ Like natural gas, hydrogen gas combustion can provide the temperatures needed for industrial process heat, while simultaneously producing no carbon emissions.^{20,21} Hydrogen's unique properties, however, preclude its use as a drop-in solution for natural gas in industrial combustion processes. Hydrogen's lower volumetric energy density, coupled with its wider flammability window, higher combustion flame speed, flame invisibility, and poorer radiative heat transfer will require some redesign of kilns and furnaces to allow for safe and efficient management of hydrogen combustion and gas flows.^{22,23} The small size of hydrogen molecules also allows them to diffuse into and through porous materials and even metals, leading to their embrittlement and eventual cracking, necessitating new materials and coatings for hydrogen storage and management.²⁴

Clean hydrogen could also decarbonize industrial processes through use as a process input. Industrial steelmaking, for example, already employs direct reduced iron (DRI) in steel manufacturing, which is iron refined from iron ore with a reducing agent, typically carbon sourced from coke or natural gas.^{25,26} Hydrogen produced by electrolysis from renewable energy could decarbonize the DRI process by replacing carbon as the reducing agent, and the heat required to make steel from this iron can be sourced through electric arc furnaces (EAF).²⁷ Similar uses for clean hydrogen as a carbon-neutral input in the manufacture of other primary metals or types of materials may exist.

NYSERDA seeks to fund technology research, development, and demonstration projects that leverage innovative technologies and strategies to safely enable and efficiently manage hydrogen combustion for hard-to-electrify medium-temperature ($100^{\circ}\text{C} \leq T < 500^{\circ}\text{C}$) and high-temperature ($T > 500^{\circ}\text{C}$) industrial process heat; or use hydrogen as a decarbonizing input in a process that either eliminates the need for high temperature process heat or enables a process that can source such heat through electrification.

Example Projects and Technologies

Example projects that may be considered under this Challenge Area include, but are not limited to:

- Novel materials and coatings that can withstand hydrogen embrittlement and the high temperatures associated with hydrogen combustion
- Designs for and demonstrations of ovens, kilns, and furnaces that account for hydrogen's properties and allow for the efficient and safe combustion of hydrogen gas
- Sensors that can detect the presence and extent of hydrogen flames
- Studies of hydrogen combustion behavior and gas flow for optimizing system design
- Studies of the kinetics of high temperature hydrogen reduction of metal oxides for metal manufacturing
- Studies of the kinetics of chemical reactions that use hydrogen as a direct input, with or without additional heat, to optimize final product quality in processes that would otherwise employ high temperature heat
- Technologies and processes that use hydrogen to decarbonize fossil-fuel-combustion-based, mid- and high-temperature industrial processes, via combustion or other means (e.g., as a process input)

¹⁹ DOE Office of Industrial Technologies, Roadmap for Process Heating Technology, 2001.

https://www.energy.gov/sites/prod/files/2014/05/f15/process_heating_0401.pdf

²⁰ DOE National Clean Hydrogen Strategy and Roadmap, 2022. <https://www.hydrogen.energy.gov/clean-hydrogen-strategy-roadmap.html>

²¹ Industrial decarbonization via hydrogen: A critical and systematic review of developments, socio-technical systems and policy options. <https://www.sciencedirect.com/science/article/abs/pii/S2214629621003017?via%3Dihub>

²² Ibid.

²³ DOE Hydrogen Program Plan, 2020. https://www.hydrogen.energy.gov/roadmaps_vision.html

²⁴ Industrial decarbonization via hydrogen: A critical and systematic review of developments, socio-technical systems and policy options. <https://www.sciencedirect.com/science/article/abs/pii/S2214629621003017?via%3Dihub>

²⁵ DOE Industrial Decarbonization Roadmap, 2022. <https://www.energy.gov/eere/industrial-decarbonization-roadmap>

²⁶ Reduction of Iron Oxides with Hydrogen – A Review, 2019.

<https://onlinelibrary.wiley.com/doi/full/10.1002/srin.201900108>

²⁷ DOE Industrial Decarbonization Roadmap, 2022. <https://www.energy.gov/eere/industrial-decarbonization-roadmap>

Examples of projects that will not be considered under this Challenge Area include:

- Using hydrogen combustion for steam boilers, where commercially mature electric alternatives exist²⁸
- Replacement of onsite fossil fuel-based combined heat and power (CHP) systems with hydrogen-based CHP
- Any project where proposed hydrogen combustion is not used for direct process heat
- Any industrial projects that fit under hydrogen production or storage challenge areas (e.g., onsite electrolyzers or onsite hydrogen storage)

Challenge Area 2: Clean Hydrogen Production and Integration with Renewable Energy Resources

Background

The Climate Act calls for the New York State to achieve 70% renewable electricity by 2030 and 100% zero-emissions electricity by 2040; to build 9GW of offshore wind by 2035 and 6GW of distributed solar by 2025 (expanded in 2022 to 10GW by 2030). These nation-leading targets make clean hydrogen produced by renewable energy specifically of interest to New York. In NYSERDA's 2022 Request for Proposals for the Purchase of Offshore Wind Renewable Energy Certificates (ORECs), for example, the solicitation noted that "NYSERDA encourages [Offshore Wind] Proposals that provide economic benefits from Clean Electrolytic Hydrogen and play a role in achieving New York's Climate Act obligations."²⁹

However, clean electrolytic hydrogen is currently not yet cost-competitive with hydrogen produced from fossil fuels.³⁰ While the recently announced federal tax credit for clean hydrogen will reduce the production cost and the DOE's Regional Hydrogen Hubs program will help to drive deployment scale, there remain technological areas of improvement that can increase electrolyzer system efficiency and durability and continue to drive down clean hydrogen production costs.

To date, alkaline electrolysis is the most mature and commercialized process with the lowest investment costs. However, its drawbacks include a high minimum load and that they are typically designed for operation at fixed process operations, which make them difficult to couple with intermittent renewable resources such as solar PV and wind.³¹ These can be mitigated to an extent with energy storage or advanced control systems.³²

Proton Exchange Membrane (PEM) electrolysis is next-most mature process with growing commercialization. Advantages of PEM electrolyzers are "lower startup and system response times, lower minimum load requirements, and greater load flexibility" making them better able to load follow and to directly couple them with intermittent renewable energy.³³ However, one of the major barriers for PEM systems is the high cost of catalysts and electrodes using noble metals, such as platinum.³⁴ According to the DOE, hydrogen from low-volume PEM electrolysis still requires an 80 percent reduction in cost to be

²⁸ Electrification of Boilers in U.S. Manufacturing, 2021. <https://www.globalefficiencyintel.com/electrification-of-boilers-in-us-manufacturing>

²⁹ NYSErDA 2022 Offshore Wind Solicitation, Request for Proposals (ORECRFP22-1)

³⁰ U.S. Department of Energy National Clean Hydrogen Strategy and Roadmap (Draft - September 2022)

³¹ Oxford Institute for Energy Studies: Cost-competitive green hydrogen: how to lower the cost of electrolyzers? (January 2022)

³² Becker et al., Battery-Buffered Alkaline Water Electrolysis Powered by Photovoltaics (2021)

³³ Lazard's Levelized Cost of Hydrogen Analysis (2021)

³⁴ Oxford Institute for Energy Studies: Cost-competitive green hydrogen: how to lower the cost of electrolyzers? (January 2022)

competitive.³⁵ Furthermore, they are not sufficiently durable or efficient to meet the standards of hydrogen production at scale.³⁶

High temperature solid oxide electrolyzer cell (SOEC) technology can leverage both electricity and heat from generation sources such as concentrated solar or nuclear power plants, and thus achieve extremely high efficiency. But the technology is not yet as mature and requires the integration and optimization with thermal sources.³⁷ Its longer startup time potentially hampers the ability to couple with intermittent renewable energy.³⁸

Across the board, electrolyzers must maintain high performance, durability, and efficiency despite ramping up or down with fluctuations in power input with direct coupling with intermittent renewable resources such as solar and wind. There is a need for further research and development in materials or optimization to increase durability and efficiency of electrolyzers and to reduce cell and membrane degradation, to further drive down costs.

Finally, in coastal or offshore areas there is an additional opportunity for further research and development on saltwater-capable electrolysis, whether coupled with desalination technologies or developing new catalysts and materials to directly electrolyze saltwater. It is necessary to improve desalination processes and reduce the environmental impact of waste brine disposal. To integrate hydrogen production with offshore wind at sea, tests and demonstrations under the weather and operating conditions at sea are needed to validate feasibility and performance.

The goal of this challenge area is to fund technology research, development, and demonstration projects that improve clean hydrogen production and direct coupling with renewable energy facilities, including but not limited to solar PV, on- and offshore wind, hydropower or nuclear power. These projects should aim to enhance the performance, efficiency, durability, or cost characteristics of electrolysis systems to enable the scale-up of these technologies in New York State.

Example Projects and Technologies

Example projects that may be considered under this Challenge Area include, but are not limited to:

- Clean hydrogen production demonstration projects directly coupled with renewable or nuclear energy facilities
- Electrolyzer optimization and controls for direct coupling with intermittent renewable technologies
- Integration of electrolysis systems with energy storage technologies such as batteries
- High temperature solid oxide electrolysis system coupled with a clean thermal energy source
- Advancement in electrode, membrane, or catalyst technology to enhance component and system durability and lifetime cost
- Saltwater-capable electrolysis (desalination via reverse osmosis coupled with electrolyzers or development of catalysts for direct saltwater electrolysis) utilizing clean electricity
- Co-location of electrolyzers / hydrogen production and offshore wind at sea
- Hybridization of hydropower plants for hydrogen production

Examples of projects that will not be considered under this challenge area include:

- Projects producing hydrogen from fossil fuels (“blue” or “grey” hydrogen)
- Projects producing hydrogen from biomass or waste-stream resources
- Projects producing clean hydrogen with carbon capture technology

³⁵ [U.S. Department of Energy National Clean Hydrogen Strategy and Roadmap \(Draft - September 2022\)](#)

³⁶ [U.S. Department of Energy: H2NEW – Hydrogen from Next-generation Electrolyzers of Water – Research](#)

³⁷ [Oxford Institute for Energy Studies: Cost-competitive green hydrogen: how to lower the cost of electrolyzers? \(January 2022\)](#)

³⁸ *ibid.*

Challenge Area 3: Mitigation of Nitrogen Oxides (NO_x) Emissions from Hydrogen Combustion

Background

Unlike fossil fuels, pure hydrogen (H₂) does not contain carbon or trace amounts of sulfur or mercury, so its combustion does not emit air pollutants such as carbon monoxide (CO), sulfur dioxide (SO₂), particulate matter (PM), or other compounds.³⁹ However, the combustion of hydrogen in air (a mixture of mostly nitrogen and oxygen) occurs at much higher flame temperatures than burning natural gas, and by comparison can potentially emit larger quantities of oxides of nitrogen (NO_x) per unit of energy.⁴⁰

The Scoping Plan specifically states that “opportunities to further reduce NO_x emissions from hydrogen combustion exist and need to be further studied,” and that RD&D strategies should include “research on emissions controls that reduce/eliminate emissions (e.g., NO_x from hydrogen combustion),” making this a priority for New York State.^{41,42} It is critical for New York to understand and mitigate localized air quality impacts from hydrogen combustion, particularly in disadvantaged and environmental justice communities that have historically been overburdened by fossil fuel pollution.

NO_x emissions can be controlled or reduced by making changes to the combustion process or by installing air pollution control equipment in the exhaust stream (such as selective catalytic reduction (SCR) technologies). Opportunities may exist for reducing NO_x emissions by changing the combustion process when shifting to clean hydrogen as a fuel. Many of the post-combustion technologies are well understood for fossil fuel combustion but often come with performance and cost trade-offs. For many industrial applications, it is unclear how NO_x emissions would compare if these applications were to shift from the current fossil fuels to hydrogen in a real-world setting. Furthermore, systems designed explicitly for hydrogen combustion can implement features that result in lower NO_x emissions.⁴³

The goal of this challenge area is to fund research, development, and demonstration (RD&D) projects that drive the state-of-the-art minimizing NO_x emissions in hydrogen combustion. More specifically, this challenge area seeks projects that test, control, or mitigate NO_x emissions from hydrogen combustion to reduce localized air pollution impacts to the extent practicable.

Example Projects and Technologies

Example projects that may be considered under this Challenge Area include, but are not limited to:

- Combustor technology (e.g., fuel/air staging, exhaust gas recirculation)
- Advanced combustion controls or optimization
- Post-combustion cleanup and treatment (e.g., selective catalytic reduction (SCR)), including the development of new catalysts or optimization of existing catalysts to improve performance.
- Studies showing the cost and performance tradeoffs of minimizing NO_x emissions.
- Demonstration projects to test the performance and effectiveness of NO_x control and mitigation strategies in real-world hydrogen combustion systems

³⁹ [Hydrogen Fuel Cell Engines and Related Technologies, Module 1: Hydrogen Properties](#)

⁴⁰ *ibid.*

⁴¹ New York State Climate Action Council Scoping Plan, [Chapter 8: Public Health](#)

⁴² New York State Climate Action Council Scoping Plan, [Chapter 13: Electricity](#)

⁴³ USDOE. 2022. *Webinar: DOE Low NO_x Targets and State-of-the-Art Technology for Hydrogen Fueled Gas Turbines.* <https://www.energy.gov/eere/fuelcells/2022-hydrogen-and-fuel-cell-technologies-office-webinar-archives#09152022>

Challenge Area 4: Hydrogen Storage Technologies for Bulk Storage and Storage in Limited Footprint Areas

Background

As New York moves to decarbonize its grid in accordance with the targets mandated in the CLCPA and outlined in the state scoping plan, electrification of large parts of state's economy and the growing proportion of renewably produced electricity on the grid will result in imbalances of electricity supply and demand on intra-day, inter-day, and seasonal timescales.^{44,45} The ability of renewable production resources like solar and wind to meet this shift in demand on intra- and inter-day timescales will depend heavily on the deployment of short duration energy storage up to 8 hours provided by batteries; New York anticipates the need for at least 17 GW of this kind of battery storage by 2050.⁴⁶

To manage seasonal imbalances on much longer timescales than 8 hours between predicted peak renewable production in the spring, summer, and fall with increased electricity demand in the winter, a zero-carbon, firm dispatchable resource of at least 18 GW would be needed by 2040.⁴⁷ This resource could take the form of hydrogen, which could be produced via electrolysis powered during periods of peak renewable electricity generation in the spring through autumn and dispatched during the winter for periods of up to 100 hours in order to ensure grid reliability and stability (See Figure 3).⁴⁸ Furthermore, this demand will be concentrated in downstate and urban areas generally removed from regions where hydrogen is expected to be produced with renewable electricity.⁴⁹

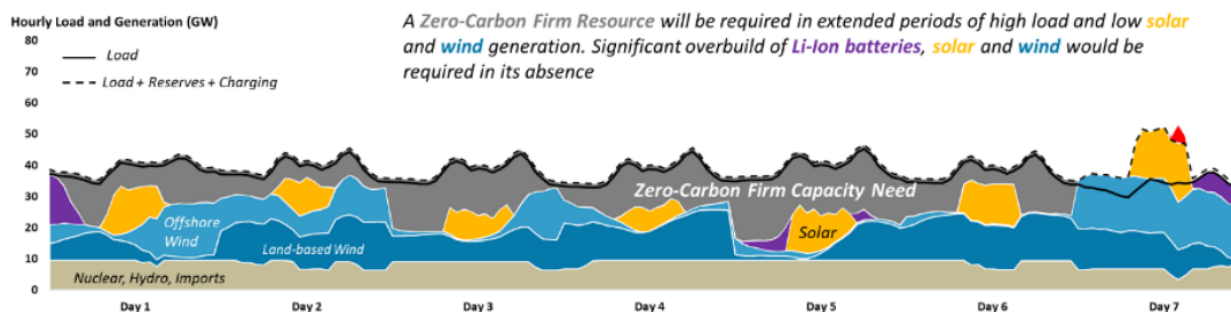


Figure 3. Zero Carbon Firm Capacity Need Over a Challenging Winter Week in 2040.⁵⁰

In order to balance both the seasonal and regional imbalances in hydrogen supply and demand, a variety of hydrogen storage solutions will be required. Bulk storage of hydrogen in geologic formations like salt caverns is already deployed to manage large-scale fluctuations in demand for hydrogen in the petrochemical sector^{51,52} and would in theory provide the most cost-effective means of managing New York's seasonal supply and demand imbalance.⁵³ However, assessing the viability of onshore and offshore geologic formations in New York and the costs associated with preparing them for hydrogen storage remain formidable barriers.

⁴⁴ New York State Climate Action Council Scoping Plan. <https://climate.ny.gov/resources/scoping-plan/>

⁴⁵ New York State Energy Storage Roadmap. <https://www.nyserda.ny.gov/-/media/Project/Nyserda/Files/Programs/Energy-Storage/ny-6-gw-energy-storage-roadmap.pdf>

⁴⁶ Ibid.

⁴⁷ Ibid.

⁴⁸ Ibid.

⁴⁹ New York State Climate Action Council Scoping Plan, Tech Supplement Annex 2: Key Drivers Outputs. <https://climate.ny.gov/-/media/project/climate/files/IA-Tech-Supplement-Annex-2-Key-Drivers-Outputs-2022-1.xlsx>

⁵⁰ New York State Energy Storage Roadmap. <https://www.nyserda.ny.gov/-/media/Project/Nyserda/Files/Programs/Energy-Storage/ny-6-gw-energy-storage-roadmap.pdf>

⁵¹ DOE National Clean Hydrogen Strategy and Roadmap, 2022. <https://www.hydrogen.energy.gov/clean-hydrogen-strategy-roadmap.html>

⁵² A Life Cycle Cost Analysis Framework for Geologic Storage of Hydrogen: A User's Tool. <https://www.osti.gov/biblio/1029761>

⁵³ Ibid.

Because demand for hydrogen will be concentrated in downstate and urban areas away from zones of hydrogen production, there is also need for compact, limited footprint storage solutions. Though hydrogen has a gravimetric energy density higher than that of gasoline (33.3 kWh/kg vs. 12.2 kWh/kg),⁵⁴ its volumetric energy density is far lower (0.0033 kWh/L for hydrogen gas at ambient pressure,⁵⁵ compared to 8.9 kWh/L for liquid gasoline⁵⁶), necessitating the use of compression tanks for storage in limited space. Cold compressed and liquid hydrogen storage could push volumetric density higher but comes with added energetic and financial costs associated with cooling and the liquefaction of hydrogen gas,^{57,58} in addition to the cost of materials needed for high-pressure tank linings.⁵⁹

Materials-based storage solutions that exploit hydrogen absorption or adsorption into solid materials, or carry hydrogen in a denser chemical form, could provide another avenue to reaching the higher volumetric energy densities needed for small footprint storage. Solid materials like metal hydrides and metal-organic frameworks (MOFs) that can in theory absorb and adsorb large quantities of hydrogen without the need for energy-intensive compression could lead to safer and more compact storage vessels.⁶⁰ These technologies remain hampered, however, by the need to operate them well outside of ambient temperature ranges to store and release hydrogen in sufficient quantities.^{61,62} Storing hydrogen in chemical carriers like ammonia and ammonia borane circumvents the volumetric energy constraint, but also requires the energy intensive application of heat and the use of catalysts to release hydrogen when needed.^{63,64,65}

NYSERDA seeks innovative proposals that address the challenges associated with both bulk storage (i.e., geological storage) and storage in limited footprint areas (i.e., in denser urban areas).

Example Projects and Technologies

Example projects that may be considered under this Challenge Area include, but are not limited to:

- Studies and surveys assessing the feasibility, potential extent, and costs of hydrogen storage in onshore or offshore geologic formations in New York State
- Studies of materials-based storage technologies like metal hydrides and metal-organic frameworks that allow for absorption and desorption at ambient temperatures
- The demonstration of physical hydrogen storage media that increase volumetric energy density and reduce costs associated with tank shell materials
- Studies of chemical carriers that can easily and reversibly store and release hydrogen
- Studies assessing the viability of undersea tank storage of hydrogen

Examples of projects that will not be considered under this challenge area include:

- Storage technologies that emit carbon dioxide when separating hydrogen from a chemical carrier

⁵⁴ DOE Hydrogen and Fuel Cell Technologies Office. Hydrogen Storage. <https://www.energy.gov/eere/fuelcells/hydrogen-storage>

⁵⁵ Hydrogen Storage Technologies for Stationary and Mobile Applications: Review, Analysis, and Perspectives. <https://www.sciencedirect.com/science/article/abs/pii/S1364032121005980?via%3Dihub>

⁵⁶ DOE Hydrogen and Fuel Cell Technologies Office. Hydrogen Storage. <https://www.energy.gov/eere/fuelcells/hydrogen-storage>

⁵⁷ Hydrogen Storage Technologies for Stationary and Mobile Applications: Review, Analysis, and Perspectives. <https://www.sciencedirect.com/science/article/abs/pii/S1364032121005980?via%3Dihub>

⁵⁸ DOE Hydrogen and Fuel Cell Technologies Office Multi-Year Research, Development, and Demonstration Plan. <https://www.energy.gov/eere/fuelcells/articles/hydrogen-and-fuel-cell-technologies-office-multi-year-research-development>

⁵⁹ Ibid.

⁶⁰ Current Research Trends and Perspectives on Materials-Based Hydrogen Storage Solutions: A Critical Review. <https://www.sciencedirect.com/science/article/abs/pii/S0360319916335285?via%3Dihub>

⁶¹ Ibid.

⁶² DOE Hydrogen and Fuel Cell Technologies Office. Materials-Based Hydrogen Storage. <https://www.energy.gov/eere/fuelcells/materials-based-hydrogen-storage>

⁶³ Ibid.

⁶⁴ DOE Hydrogen and Fuel Cell Technologies Office. Chemical Hydrogen Storage Materials

⁶⁵ Hydrogen Carriers. <https://www.nature.com/articles/natrevmats201667>

D. Projects Specifically Not of Interest

To further assist proposers on the eligibility of specific projects, below, and in addition to the projects outlined above, is a list of example projects that are specifically not of interest to NYSERDA and not eligible for funding under this PON (NOTE: this is not an exhaustive list and is provided for indicative purposes only):

- Proposed technologies that are not based on sound scientific principles
- Proposed solutions that do not use technologies related to hydrogen (e.g., decarbonizing high temperature industrial manufacturing process with molten salt reactors)
- Proposed hydrogen technologies that will increase greenhouse gas emissions
- Development of hydrogen safety codes and standards
- Funding for hydrogen safety reviews

III. Proposal Requirements

To submit a Proposal, the proposer must submit all attachments listed below. The goal should be to concisely present the information needed to fully address the Proposal Evaluation Criteria (Section IV). In addition, **the proposer should also attach the concept paper as submitted to the federal funding agency**. If the proposer's concept paper was encouraged by the federal agency for proposal submission, or the project has been awarded, additional **proof of a federal funding status or decision** should be submitted as well.

Required Attachments for Proposal:

- ☐ Attachment A – Proposal Narrative
- ☐ Attachment B – Executive Summary Slide
- ☐ Attachment C – TRL/CRL Calculation Worksheet
- ☐ Concept Paper Submitted to Federal Funding Agency
- ☐ Proof of Federal Funding Status*
- ☐ Supporting Documents (maximum 10 pages, see Att. A – Proposal Narrative Template for details)

*Federal Funding Status Information Required:

Has your concept paper been submitted? Have you been encouraged by the federal funding agency to submit a full proposal? Have you secured federal funding for this project? If yes to any of these, please provide proof of status of federal funding – e.g., proof of submission, encouragement letter, funding decision letter, etc.

Proposers must carefully review the required attachments to ensure that all required sections are completed. Failure to do so may result in the proposal being rejected as non-responsive. It is the proposer's responsibility to ensure that all pages have been included in the proposal and that they have been timely submitted in accordance with the appropriate due date and times.

Proposals that exceed the page limits or fail to follow the format guidelines will be rejected as non-responsive. Proposals deemed non-responsive will not be eligible for awards. If you believe proprietary information must be submitted to provide an adequate proposal, you must comply with the Section V instructions for submitting proprietary material. Each page of the proposal should state the name of the proposer, the PON number (PON 5322), and the page number.

Proposals determined to be compliant with application procedures and responsive to the solicitation will be subject to review by a scoring committee comprising internal and external technical experts in accordance with Section IV. Proposal Evaluation. Only the most technically meritorious Proposals will be awarded an invitation from NYSERDA to enter into an agreement. Proposals not meriting an award for contracting may be debriefed as requested.

A. Compliance with New York State Finance Law

In compliance with §139-j and §139-k of the State Finance Law (see Section V, General Conditions below for additional information), proposers will be required to answer questions during proposal submission, which will include making required certification under the State Finance Law and to disclose any Prior Findings of Non-Responsibility.

B. Cost Sharing and Recoupment

There is no minimum proposer cost share requirement in this solicitation. However, scoring preference will be given to proposals that best leverage NYSERDA funding by providing greater amounts of non-NYSERDA cost share funding (see IV. Proposal Evaluation). This non-NYSERDA cost share includes the federal funding amount requested in the proposer's federal funding application, and any additional cost

sharing contributions such as from the proposer, other team members, and other government or private sources. Contributions of direct labor (for which the laborer is paid as an employee) and purchased materials may be considered "cash" contributions. Unpaid labor, indirect labor, or other general overhead may be considered "in-kind" contributions. Total non-NYSERDA cost share is the sum of cash and in-kind contributions from non-NYSERDA sources. NYSERDA will not pay for efforts which have already been undertaken. The proposer or proposing team cannot claim as cost-share any expenses that have already been incurred.

A summary of NYSERDA funding per award for each category is provided below:

Funding Category	Estimated Technology Readiness Level (TRL)	NYSERDA Funding Per Award
Category A: Feasibility & Research Studies	1-3	\$400,000
Category B: Product Development*	4-6	\$1,000,000
Category C: Pilot & Demonstration Projects	7-9	\$2,000,000

**Product Development projects will be subject to recoupment requirements*

NYSERDA reserves the right to negotiate the project category, scope of work, budget, and funding levels on all awarded projects. Efforts requesting more than \$250,000 from NYSERDA may be funded in phases separated by go/no-go milestones.

A payment based on the final deliverable or final report will be reserved until project completion. If awarded, NYSERDA may choose to negotiate the amount of such payment.

Recoupment

For any new projects exceeding \$100,000 in NYSERDA funding that involve **product development, including business development**, NYSERDA will require a royalty based on sales and/or licensing of the new product developed (Please see Attachment D: Sample Agreement Template for specific recoupment obligations). **Recoupment is not required for demonstration projects.** Please see the definitions below to determine if your project will be subject to recoupment. Please note that NYSERDA will make final determinations as to whether proposals fit within the demonstration or product development categories.

- **Product Development:** efforts to bring a new or improved product to market including business case development, product design, scale, and field testing, but not including earlier stage technical feasibility or proof of concept development. Technologies with a Technology Readiness Level (TRL) exceeding 3 are to be considered Product Development (see Attachment D: TRL CRL Calculator for additional guidance on TRLs). Field testing or pilot deployments of a non-commercial, non-warranted technology are considered Product Development.
- **Demonstration:** a project intended to increase sales or usage of a commercialized product already in the marketplace, with results used to generate objective performance information for customers or policymakers. At this stage, the product is available for commercial sale and warranted. While incremental improvements may be incorporated based on the demonstration results, the final product design is essentially complete. Note: pilot deployments or other field demonstrations that will inform additional product development will be considered as a Product Development project and therefore subject to recoupment.

Projects where NYSERDA's share of funding is \$100,000 or less will generally not require recoupment. Please note: NYSERDA may decline to contract with awardees that are delinquent with respect to recoupment payments or sales reporting for any previous NYSERDA agreement.

C. Annual Metrics Reports

If awarded, the proposer will be required to submit to NYSERDA's Project Manager on an annual basis, a prepared analysis and summary of metrics addressing the anticipated energy, environmental and economic benefits that are realized by the project. All estimates shall reference credible sources and estimating procedures, and all assumptions shall be documented. Reporting shall commence the first calendar year after the contract is executed. Reports shall be submitted by January 31st for the previous calendar years' activities (i.e., reporting period). The Contractor shall provide metrics in accordance with a web-based form, which will be distributed by NYSERDA. NYSERDA may decline to contract with awardees that are delinquent with respect to metrics reporting for any previous or active NYSERDA agreement.

IV. Proposal Evaluation

Proposals that meet solicitation requirements will be reviewed by a Scoring Committee using the Evaluation Criteria below **listed in order of importance**. At NYSERDA's discretion, proposers may be requested to interview with all or part of the Scoring Committee to address any potential questions or clarifications outlined in the Proposal. Proposers will be notified if they are requested to attend an interview.

A. Evaluation Criteria

Project Benefits and Value

- The proposed solution will promote hydrogen innovation in New York State.
- The proposed solution will bring economic benefits to New York State in the form of manufacturing capability, supply chain development, technical services, or other commercial activity. Jobs are expected to be created and/or retained in New York State as a result of this project. Where appropriate, the proposer has quantified the potential benefits.
- The proposer exhibits strong market demand for this solution.
- The proposed solution has potential to significantly reduce costs for the hydrogen ecosystem.
- The proposed project addresses potential solutions in low-income or historically disadvantaged communities.
- The proposer leverages NYSERDA funding with federal funding, with higher ratios of federal funding to NYSERDA funding considered more favorably.
- In addition to federal funds, the proposer provides private and/or other sources of cost share funding for the project (with letters of commitment), with greater amounts of non-NYSERDA cost share considered more favorably.
- The project cost is justified and reasonable with respect to the level of effort proposed, the expected benefits, and the potential market or deployment opportunity.

Innovation, State of the Art, and Technical Merit

- The Proposal identifies a solution that is aligned with and is essential to the advancement of the selected Challenge Area.
- The proposed solution addresses a core technical barrier that is not being addressed by others.
- The proposed solution has a high potential for commercialization, replicability, and/or scalability in New York State and if applicable, the Proposal describes a pathway to commercialize the product or service.
- The proposer has demonstrated insightful understanding of the fundamental scientific principles and the current state-of-the-art relative to the Challenge Area.
- The proposed project is technically sound, feasible, innovative, and superior to alternatives, and will make significant progress toward solving the identified problem.

Project Plan, Scope, Risks, and Challenges

- The proposer has secured or shared sufficient detail about intended Federal co-funding for the project and the status of the funding. If applicable, the proposer's federal concept paper has been reviewed and the proposer has been encouraged to submit a full proposal for federal funding.
- The proposed task list and forecasted timeline are reasonable for the project at this stage.
- Technical and programmatic risks are understood and disclosed, with associated mitigation measures to ensure project success.
- The proposed work can be accomplished within the amount of time, effort, and resources proposed.
- The selected Funding Category is appropriate for the proposed solution.

- If applicable, the proposer has explained the proposed demonstration site and/or outside organizations that the team will need to provide data, equipment, support, facilities, etc. Letters of commitment and support from these organizations are not required but viewed favorably.

Team Experience and Capabilities

- The proposed team has the necessary expertise and resources to carry out the proposed work, including members with industry and business experience as well as technical skill.
- The proposal describes the team structure and staff roles and responsibilities.

B. Program Policy Factors

NYSERDA reserves the right to accept or reject proposals based on the following program policy factor(s):

- Whether the proposed project will accelerate technology advances in areas that industry or the company, by itself, is not likely to undertake.
- The degree to which the proposal expands the portfolio of technical areas and project types (research, development, or demonstration) of NYSERDA.
- The consideration of the impact on, and benefits to, a diversity of communities/locations, including low-income and rural communities, partnerships with minority serving and/or owned businesses.

V. General Conditions

Proprietary Information - Careful consideration should be given before confidential information is submitted to NYSEDA as part of your proposal. Review should include whether it is critical for evaluating a proposal, and whether general, non-confidential information, may be adequate for review purposes. The NYS Freedom of Information Law, Public Officers law, Article 6, provides for public access to information NYSEDA possesses. Public Officers Law, Section 87(2)(d) provides for exceptions to disclosure for records or portions thereof that "are trade secrets or are submitted to an agency by a commercial enterprise or derived from information obtained from a commercial enterprise and which if disclosed would cause substantial injury to the competitive position of the subject enterprise." Information submitted to NYSEDA that the proposer wishes to have treated as proprietary, and confidential trade secret information, should be identified and labeled "Confidential" or "Proprietary" on each page at the time of disclosure. This information should include a written request to except it from disclosure, including a written statement of the reasons why the information should be excepted. See Public Officers Law, Section 89(5) and the procedures set forth in 21 NYCRR Part 501 <https://www.nyserda.ny.gov/About/-/media/Files/About/Contact/NYSEDA-Regulations.ashx>. However, NYSEDA cannot guarantee the confidentiality of any information submitted.

Omnibus Procurement Act of 1992 - It is the policy of New York State to maximize opportunities for the participation of New York State business enterprises, including minority- and women-owned business enterprises, as bidders, subcontractors, and suppliers on its procurement Agreements.

Information on the availability of New York subcontractors and suppliers is available from:

Empire State Development
Division for Small Business
625 Broadway
Albany, NY 12207

A directory of certified minority- and women-owned business enterprises is available from:

Empire State Development
Minority and Women's Business Development Division
625 Broadway
Albany, NY 12207

State Finance Law sections 139-j and 139-k - NYSEDA is required to comply with State Finance Law sections 139-j and 139-k. These provisions contain procurement lobbying requirements which can be found at <https://online.ogs.ny.gov/legal/lobbyinglawfaq/default.aspx>. Proposers are required to answer questions during proposal submission, which will include making required certification under the State Finance Law and to disclose any Prior Findings of Non-Responsibility (this includes a disclosure statement regarding whether the proposer has been found non-responsible under section 139-j of the State Finance Law within the previous four years).

Tax Law Section 5-a - NYSEDA is required to comply with the provisions of Tax Law Section 5-a, which requires a prospective contractor, prior to entering an agreement with NYSEDA having a value in excess of \$100,000, to certify to the Department of Taxation and Finance (the "Department") whether the contractor, its affiliates, its subcontractors and the affiliates of its subcontractors have registered with the Department to collect New York State and local sales and compensating use taxes. The Department has created a form to allow a prospective contractor to readily make such certification. See, ST-220-TD (available at http://www.tax.ny.gov/pdf/current_forms/st/st220td_fill_in.pdf). Prior to contracting with NYSEDA, the prospective contractor must also certify to NYSEDA whether it has filed such certification with the Department.

The Department has created a second form that must be completed by a prospective contractor prior to contracting and filed with NYSEDA. See, ST-220-CA (available at

http://www.tax.ny.gov/pdf/current_forms/st/st220ca_fill_in.pdf). The Department has developed guidance for contractors which is available at <http://www.tax.ny.gov/pdf/publications/sales/pub223.pdf>.

Contract Award - NYSERDA anticipates making multiple awards under this solicitation. NYSERDA anticipates a contract duration of up to three (3) years, unless NYSERDA management determines a different structure is more efficient based upon proposals received. A contract may be awarded based on initial applications without discussion, or following limited discussion or negotiations pertaining to the Statement of Work. Each proposal should be submitted using the most favorable cost and technical terms. NYSERDA may request additional data or material to support applications. NYSERDA will use the Attachment D: Sample Agreement Template to contract successful proposals. NYSERDA may at its discretion elect to extend and/or add funds to any project funded through this solicitation. NYSERDA reserves the right to limit any negotiations to exceptions to standard terms and conditions in the Sample Agreement to those specifically identified in the checklist questions. Proposers should keep in mind that acceptance of all standard terms and conditions will generally result in a more expedited contracting process. NYSERDA expects to notify proposers in approximately eight (8) to twelve (12) weeks from the proposal due date whether your proposal has been selected to receive an award. NYSERDA may decline to contract with awardees that are delinquent with respect to any obligation under any previous or active NYSERDA agreement.

Recoupment - For any new product research and/or development, NYSERDA will generally require a royalty based on sales of the new product developed. NYSERDA's standard royalty terms are 1% of sales / ten percent (10%) of all license revenue accruing to the Contractor for products produced (for a period of fifteen years or until the Contractor pays NYSERDA an amount equal to the amount of funds paid by NYSERDA to the Contractor, whichever comes first).

Accessibility Requirements - NYSERDA requires contractors producing content intended to be posted to the Web to adhere to New York State's Accessibility Policy. This includes, but is not limited to, deliverables such as: documents (PDF, Microsoft Word, Microsoft Excel, etc.), audio (.mp3, .wav, etc.), video (.mp4, .mpg, .avi, etc.), graphics (.jpg, .png, etc.), web pages (.html, .aspx, etc.), and other multimedia and streaming media content. For more information, see [NYSERDA's Accessibility Requirements](#).

Limitation - This solicitation does not commit NYSERDA to award a contract, pay any costs incurred in preparing a proposal, or to procure or contract for services or supplies. NYSERDA reserves the right to accept or reject any or all proposals received, to negotiate with all qualified sources, or to cancel in part or in its entirety the solicitation when it is in NYSERDA's best interest. NYSERDA reserves the right to reject proposals based on the nature and number of any exceptions taken to the standard terms and conditions of the Sample Agreement. NYSERDA reserves the right to disqualify proposers based upon the results of a background check into publicly available information or the presence of a material possibility of any reputational or legal risk in making of the award.

Disclosure Requirement - The proposer shall disclose any indictment for any alleged felony, or any conviction for a felony within the past five years, under the laws of the United States or any state or territory of the United States and shall describe circumstances for each. When a proposer is an association, partnership, corporation, or other organization, this disclosure requirement includes the organization and its officers, partners, and directors or members of any similarly governing body. If an indictment or conviction should come to the attention of NYSERDA after the award of a contract, NYSERDA may exercise its stop-work right pending further investigation or terminate the agreement; the contractor may be subject to penalties for violation of any law which may apply in the particular circumstances. Proposers must also disclose if they have ever been debarred or suspended by any agency of the U.S. Government or the New York State Department of Labor.

Vendor Assurance of No Conflict of Interest or Detrimental Effect - The proposer shall disclose any existing or contemplated relationship with any other person or entity, including any known relationships with any member, shareholders of 5% or more, parent, subsidiary, or affiliated firm, which would constitute an actual or potential conflict of interest or appearance of impropriety, relating to other

clients/customers of the proposer or former officers and employees of NYSERDA, in connection with proposer's rendering services as proposed. If a conflict does or might exist, please describe how your company would eliminate or prevent it. Indicate what procedures will be followed to detect, notify NYSERDA of, and resolve any such conflicts.

The proposer must disclose whether it, or any of its members, or, to the best of its knowledge, shareholders of 5% or more, parents, affiliates, or subsidiaries, have been the subject of any investigation or disciplinary action by the New York State Commission on Public Integrity or its predecessor State entities (collectively, "Commission"), and if so, a brief description must be included indicating how any matter before the Commission was resolved or whether it remains unresolved.

Public Officers Law – For any resulting awards, the Contractor and its subcontractors shall not engage any person who is, or has been at any time, in the employ of the State to perform services in violation of the provisions of the New York Public Officers Law, other laws applicable to the service of State employees, and the rules, regulations, opinions, guidelines or policies promulgated or issued by the New York State Commission on Ethics and Lobbying in Government, or its predecessors (collectively, the "Ethics Requirements"). Proposers are reminded of the following Public Officers Law provision: contractors, consultants, vendors, and subcontractors may hire former NYSERDA employees. However, as a general rule and in accordance with New York Public Officers Law, former employees of NYSERDA may neither appear nor practice before NYSERDA, nor receive compensation for services rendered on a matter before NYSERDA, for a period of two years following their separation from NYSERDA service. In addition, former NYSERDA employees are subject to a "lifetime bar" from appearing before any state agency or authority or receiving compensation for services regarding any transaction in which they personally participated, or which was under their active consideration during their tenure with NYSERDA.

Any awardee will be required to certify that all of its employees, as well as employees of any subcontractor, whose subcontract is valued at \$100,000 or more who are former employees of the State and who are assigned to perform services under the resulting contract, shall be assigned in accordance with all Ethics Requirements. During the term of any agreement, no person who is employed by the contractor or its subcontractors and who is disqualified from providing services under the contract pursuant to any Ethics Requirements may share in any net revenues of the contractor or its subcontractors derived from the contract. NYSERDA may request that contractors provide it with whatever information the State deems appropriate about each such person's engagement, work cooperatively with the State to solicit advice from the New York State Commission on Ethics and Lobbying in Government, and, if deemed appropriate by the State, instruct any such person to seek the opinion of the New York State Commission on Ethics and Lobbying in Government. NYSERDA shall have the right to withdraw or withhold approval of any subcontractor if utilizing such subcontractor for any work performed would be in conflict with any of the Ethics Requirements. NYSERDA shall have the right to terminate any contract at any time if any work performed is in conflict with any of the Ethics Requirements.

Due Diligence – NYSERDA, at its discretion, may conduct broad due diligence to validate any or all elements of an application and to assess applicants' prospects of success, including gathering information to assess a proposal relative to any of the topics listed in evaluation criteria, whether or not such topic is explicitly addressed in a proposal. NYSERDA may conduct due diligence on some or all proposals based on NYSERDA's current guidelines at the time of a review. NYSERDA staff may follow up with proposers to request additional information or clarification regarding applicant's proposal, including questions regarding applicant's business prospects and resources, whether or not those questions are specifically related to the elements of the proposal. Additionally, customized due diligence may be conducted by internal or external staff or contractors based on questions on any proposal raised by NYSERDA staff and/or the Scoring Committee. Due diligence may include (but is not limited to): interviews of independent references and background checks of team members; assessment of prior business experience of any team member associated with a proposal; research on intellectual property claims; customer and partner reference checks; market research on the applicants' target market and any other related or possibly competitive technology or market area; research to validate any assumptions on current or future revenues, costs, capital needs, and financing prospects for proposers' business,

including similar (or unrelated) technologies, processes, or competitive solutions; or any other research that could reasonably inform the evaluation of a proposal, or the prospects for commercial success of the proposers' business (whether directly related to, or unrelated to the specific elements in a proposal). Due diligence may include discussions with proposers' former and current business partners, employees, investors, customers, and competitors. Due diligence may be conducted by NYSERDA personnel or contractors including members of the scoring committee, before, during, or after a scoring process, and prior to finalization of a contract award, any information gleaned in diligence may be used to score or re-score a proposal or apply a program policy factor.

EO 16 Protocols – Pursuant to Executive Order No. 16 issued on March 17, 2022, all vendors responding to bids or contracting with New York State must certify, using the form provided as part of this solicitation, their status with regard to conducting business operations in Russia, and that any such business operations in Russia conducted on behalf of the vendor are determined to be permitted under any of the allowable exemptions. The term vendor is intended to encompass bidders prior to contract award, contractors who have received a contract award, contract assignees, or contractors for whom an extension to an existing contract is being pursued. Exemption decisions are in NYSERDA's sole discretion and are final decisions. NYSERDA reserves the right to solicit additional materials or information regarding the responses or materials provided by a vendor.

Pursuant to Executive Order No. 16, all vendors will be vetted to ensure that they are not on the federal sanctions list at <https://sanctionsearch.ofac.treas.gov/>. There is no waiver or exemption process for vendors appearing on the federal sanctions list.

The Executive Order remains in effect while sanctions imposed by the federal government are in effect. Accordingly, vendors who may be excluded from award because of current business operations in Russia are nevertheless encouraged to respond to solicitations to preserve their contracting opportunities in case sanctions are lifted during a solicitation, or after award in the case of some solicitations.

VI. Solicitation Attachments:

Attachment A – Proposal Narrative Template

Attachment B – Executive Summary Slide Template

Attachment C – TRL/CRL Calculation Worksheet

Attachment D – Sample Agreement Template